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NATIONAL EMISSIONS DATA SYSTEM POINT SOURCE INVENTORY FOR THE STATE OF KANSAS

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PEDCo-Environmental Specialists, Incorporated

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16. Abstracts The purpose of the task performed was to complete a National Emissions Data System (NEDS) form for each identified point source in the state of Kansas. All NEDS forms were completed as far as possible, based on information in the state's file. A general description of the sources is given. The EPA publication APTD-1135, "Guide for Compiling a Comprehensive Emission Inventory," March 1973, was used as a guideline for completing the point source emission inventory. EPA publication AP-42, "Compilation of Air Pollutant Emission Factors," February 1972, was used as the source of emission factors for calculating emission estimates. Source compliance status is discussed and is related to emission factors and State of Kansas Air Pollution Emission Control Regulations. The procedures, tables, graphs, regulations and conventions used to calculate the allowable emissions to be entered on the NEDS form are described. An explanation of the variations when filling our NEDS forms for specific sources is given. A total of approximately 4,000 NEDS forms for 800 companies were completed, based on information obtained from the Kansas State Agency files.

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1.0 INTRODUCTION

1.1 PURPOSE AND SCOPE

The purpose of the task performed was to complete a National Emissions Data System (NEDS) form for each identified point source in the State of Kansas. These forms were suitable for key punching. It was estimated that there were 3500 point sources identified in the state files. All NEDS forms were completed, as far as possible, based on the information in the state's files.

1.1.1 Work Priorities

The first priority was to complete (update) all sources already in the NED System. The second priority was to complete sources on which the state has a compliance schedule. PEDCo was supplied a list of these sources by the state. The next priority was to complete sources that were >100 TPY emitters. After that, the balance of companies were completed as available manhours permitted.

1.1.2 General Description of Sources

Agricultural operations comprised the largest group of sources in the State of Kansas. They were located mainly in rural areas and consisted largely of grain elevators and alfalfa dehydrators. Grain elevators made up the largest group

of a single type of source. Other sources included rock crushers, petroleum refineries and various manufacturing operations. The areas with the greatest concentration of point sources were the counties of Reno, Sedgwick, Shawnee, and Wyandotte.

1.1.3 Work Accomplished

A total of approximately 4,000 NEDS forms for 800 companies were completed, based on information obtained from the Kansas State Agency files. The original forms were sent to the Project Officer with a copy to Region VII headquarters in Kansas City. In addition, under the direction of the Project Officer a copy was also sent to the Kansas State Agency.

The first priority sources, sources already in the NED System, were completed as far as possible. Sources on the compliance schedule list supplied by the state agency were also completed as far as possible. Data was extracted from the state files for all sources estimated to emit >100 TPY. However, for the >100 TPY emitters the estimated emissions and allowable emissions were not calculated in all cases where there was adequate information to do so. This was due to insufficient funds to complete the task. Approximately one-third of the >100 TPY sources were without these calculations. Additional sources from the A's and part of the B's in the State's alphabetical files were completed.

2.0 METHODOLOGY - KANSAS POINT SOURCES

2.1 GENERAL

Government Publication APTD-1135, "Guide for Compiling a Comprehensive Emission Inventory", revised March 1973, was used as a guideline for completing the Kansas point source emission inventory. UTM coordinates were not determined for the point sources in Kansas. This was due to lack of sufficient information to locate the sources on USGS maps. However, UTM zones as specified on page 2-5 of APTD-1135, were assigned to the point sources.

2.1.1 Confidentiality

All sources in Kansas supplied information to the Kansas State Department of Health with the understanding that all information except actual emissions would be held in confidence. Therefore, confidentiality was noted by entering a one (1) in column 72 of card 6 on all NEDS sheets.

2.1.2 Standard Forms

PEDCo prepared 80 standard NEDS forms to aid in the completion of the point sources. See Figure 2.1 and Figure 2.2 for a blank NEDS form and a sample PEDCo standard form. These standard sheets covered the majority of sources in Kansas. The information contained on the standard forms included SIC number, IPP code, control equipment, zero emissions and estimation method where applicable, zero or infinite allowable emissions where

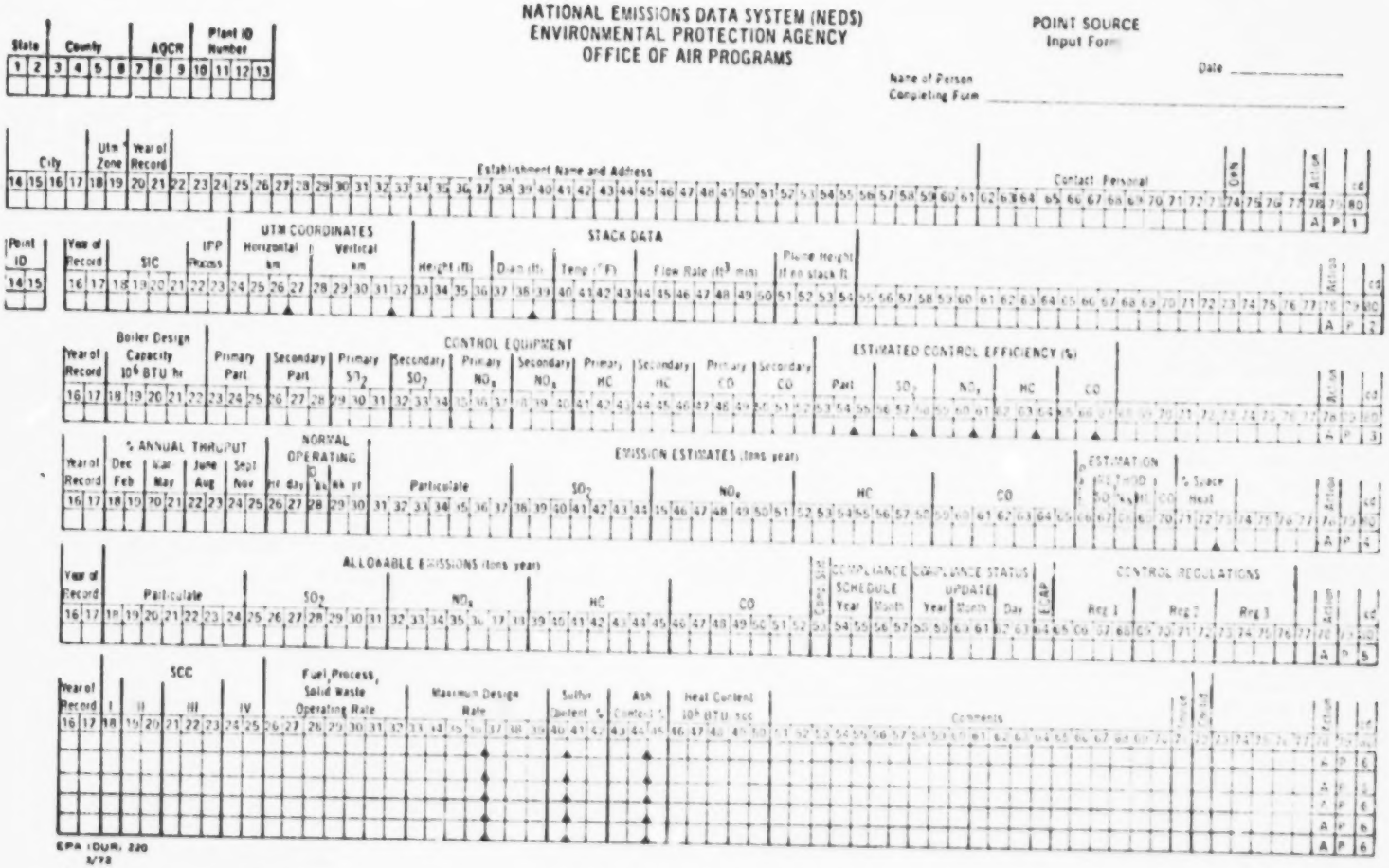

Figure 2.1. A Blank NEDS Form.

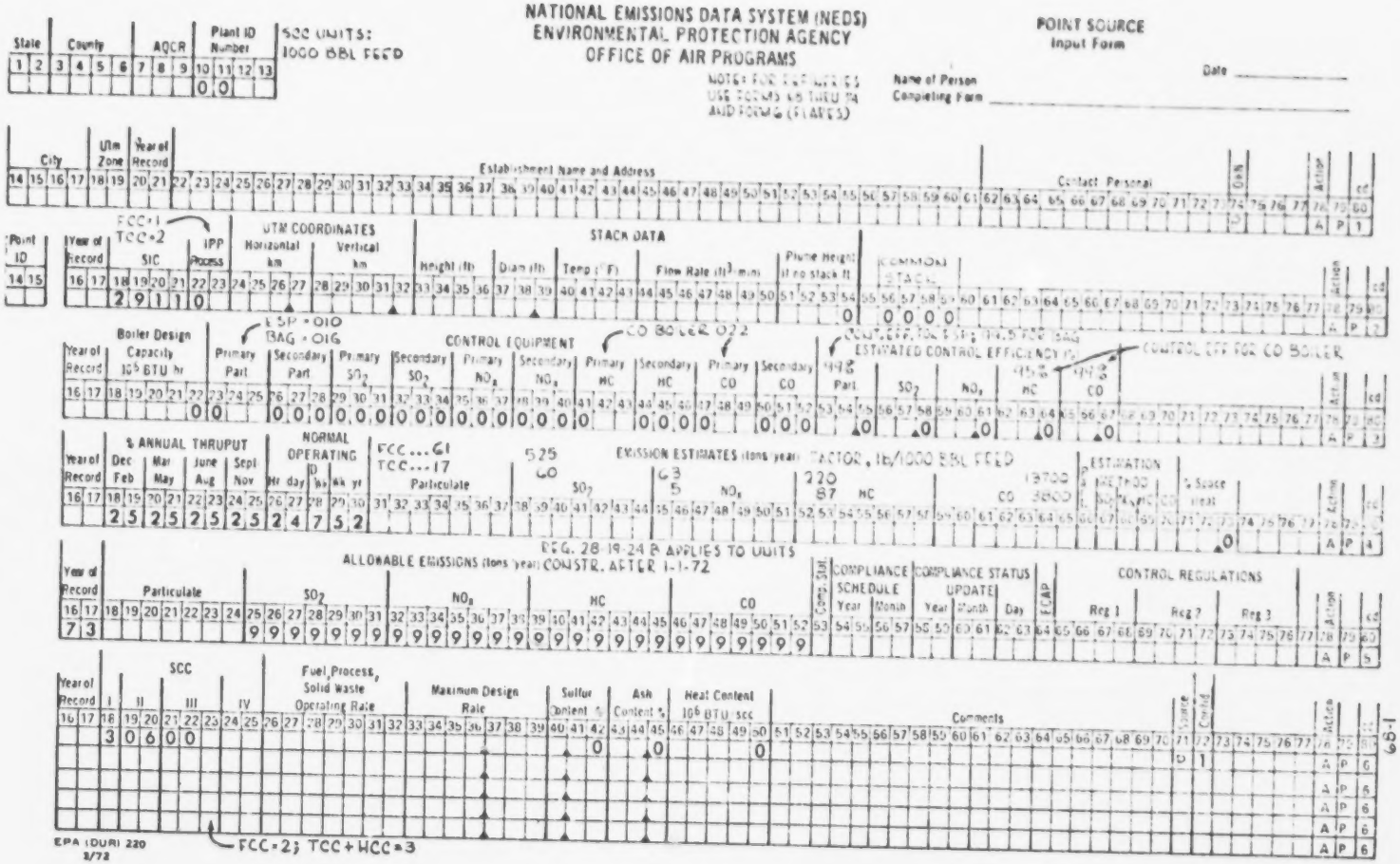

Figure 2.2. Sample PEDCo Standard Form.

applicable, Source Classification Code (SCC) number, SCC units, and emission factors. For each NEDS sheet completed, a copy of the appropriate PEDCo standard form was used. A duplicate set of PEDCo standard forms was given to the Kansas State Department of Health to aid them in completing additional point sources.

2.1.3 Location of Company Files

The point sources were arranged alphabetically in the Kansas filing system. Whenever a company file was removed by state personnel, an out of file card was inserted in it's place. The out of file card contained the name of the company removed and the initials of the person who removed the file. Notation of this information insured location of all files.

2.1.4 Emissions

Government Publication AP-42, "Compilation of Air Pollutant Emission Factors", February 1972, was used as the source of emission factors for calculating emission estimates. When stack tests of emissions were reported by the source, they were used to calculate emission estimates and the estimation method was shown to be by stack tests. If emissions were reported by the source but not specified to be the results of stack tests, the annual emissions were calculated using this information but the estimation method was recorded as a guess.

When in-process fuels were burned, emissions from the fuel were calculated using boiler emission factors. The estimation method recorded was a three (3), denoting that the emissions

were calculated by an AP-42 emission factor. The in-process fuel emissions were calculated only for pollutants other than those given off by the process. In no case were process emissions and in-process fuel emissions added together.

Actual emissions were hand calculated for all sources that reported their hourly emissions. Sources with adequate information to calculate emissions (that is, annual thruput and control equipment) but an AP-42 emission factor did not exist, had their emissions hand calculated using a four (4) as the estimation method, denoting a guess. However, actual emissions were not hand calculated for all sources that had both adequate information and an AP-42 emission factor. This was due to insufficient funds to complete that operation and there was adequate information for the computer to calculate the actual emissions.

2.1.5 Compliance Status

The Kansas State Department of Health evaluated sources for compliance based on AP-42 emission factors and State of Kansas Air Pollution Emission Control Regulations. Estimated emissions and allowable emissions were calculated by the state to determine if the source complyed with the regulations. Based on this determination by the state, if the source was judged in compliance a one (1) was entered in column 53, card 5 of the NEDS sheet to signify compliance with the regulations. If the source was judged to be out of compliance, this was indicated on the NEDS sheet by entering a two (2) in column 53 of card 5. The code of two (2) meant that the source was not in compliance

with existing legislation and no variance had been given (variances were not granted in the State of Kansas).

In cases where the state felt there were no applicable emission factors they did not conduct a formal evaluation under Regulation 28-19-20 regarding particulate emission limitations. Instead, all sources were considered as being in compliance by the Kansas State Department of Health if, upon a preliminary plant inspection, no violations of Regulations 28-19-50 regarding visible emissions and 28-19-51 regarding dust losses from materials handling and storage, were noted. However, full compliance with these regulations had to be established on the basis of field observations under a variety of operational and climatic conditions. Although the source was therefore not considered officially in full compliance, they were considered in compliance until such a time official compliance status could be established. If a source was considered in compliance by the state but subsequent calculations by PEDCo resulted in the emission estimate exceeding allowable emissions, the source was still shown to be in compliance on the NEDS sheet.

For sources recorded as in compliance, the date the applicable regulations became effective was entered in the columns titled Compliance Status Update, columns 58 through 63 of card 5. For Kansas this date was January 1, 1971.

Sources not in compliance were required to submit a compliance schedule that would bring the source into compliance. The year and month that the source was scheduled to be in compliance was entered in the columns titled Compliance Schedule, columns 54

through 57 of card 5. For sources out of compliance and on compliance schedules, the information entered in the columns headed Compliance Status Update (columns 58 through 63 of card 5) represented the latest date of any changes (milestones reached) as reported in the source's quarterly report to the agency. If no quarterly report had been submitted to the agency, these columns were left blank.

When a company indicated that the goals of their compliance schedule had been met, they were still considered out of compliance until a formal plant inspection had been made by the agency. Therefore, unless there was evidence of a successful inspection, PEDCo considered these sources to be out of compliance and entered a two (2) in column 53 of card 5.

2.1.6 Plant I.D. Numbers

Plants that were assigned I.D. numbers for a previous inventory were reassigned the same numbers in this emission inventory. The next sources assigned I.D. numbers were those on compliance schedules. A list of compliance scheduled sources was supplied by the State Agency. The remaining plants were assigned plant I.D. numbers in alphabetical order.

2.1.7 SIC and IPP Codes

Standard Industrial Classification (SIC) codes with IPP Process Identification codes are listed in Appendix A.4 of APTD-1135. The SIC code was entered in columns 18 through 21 and the IPP code in columns 22 and 23, both on card 2. If the appropriate SIC code was not listed in Appendix A.4, it was found in the 1972 SIC Manual.

2.1.8 Stack Data

If there was a stack the height, diameter, temperature, and flow rate were entered in the appropriate columns and a zero was entered in plume height. If there was no distinct stack, zeros were entered for height, diameter, and flow rate and data was entered for temperature and plume height. Common stack information was entered in columns 56 through 59 of card 2. If there was no common stack, zeros were entered in these columns and if common stack information was unknown, they were left blank.

2.1.9 Control Equipment and Efficiency

Control equipment codes were taken from Appendix A.3 of APTD-1135. For all points where the control equipment was known, a control efficiency was estimated. Control efficiency was necessary to calculate emission estimates.

2.1.10 Percent Annual Thruput and Normal Operating Schedule

Percent annual thruput was estimated for all sources that reported their normal operating schedule. If a source did not report any seasonal variation, it was assumed they operated 52 weeks per year and the thruput distributed evenly. If the hours per day and days per week operating schedule was not reported, none was assumed for the NEDS sheet. If the operation included space heat or operated less than 50 weeks per year, the percent thruput was varied to reflect these seasonal changes.

2.1.11 Sulfur Content

If a substantial amount of fuel oil was burned and no percent sulfur content was reported, columns 40 through 42

of card 6 (sulfur content) were left blank. The sulfur content of oil was assumed in only a few instances when the amount of fuel burned was quite small. The amount of sulfur assumed was 0.5% and whenever this assumption was made it was noted in the margin of the NEDS sheet.

2.1.12 Heat Content of Fuels

If the heat content of fuels were not reported by the source, the following values were assumed. Natural gas was assumed to have 1,000 BTU/ft^3, distillate fuel oil was assumed to have 150,000 BTU/gal, and residual fuel oil was assumed to have 150,000 BTU/gal. If LPG was unspecified as to propane or butane it was assumed to be equal to propane or 91,000 BTU/gal.

2.1.13 Additional Information Required

A list of sources for which additional information was required was compiled when the information on the NEDS sheet was insufficient to calculate the emission estimates. The main entries needed for the calculations were control equipment and annual thruput or operating rate. The Kansas Department of Health was given this list in order to obtain the information needed to calculate emissions.

2.1.14 List of Companies and Plant I.D. Numbers

A list was made, by county, of companies and their plant I.D. numbers. This list also included whether or not the source was in compliance, the compliance schedule deadline (if on a compliance schedule), and the number of NEDS forms filled out for that source.

2.2 CALCULATION OF ALLOWABLE EMISSIONS

The NEDS forms contained information fields for allowable emissions, as defined by the State of Kansas Air Pollution Control Regulations. For purposes of the Kansas point sources the following procedures and conventions were used in completing card 5, columns 18-52 of the NEDS forms.

All processes which, by their nature, were not emitters of a specific pollutant had a zero entered in the appropriate column in the allowable emissions information field. For example, see the NO_x emissions indicated on Figure 2.3. Note that when an actual emission of zero tons per year is shown only because the source is small or well-controlled, allowable emissions were calculated and entered on card 5. See particulate emissions on Figure 2.4 for example. Where allowable emissions were calculated to be less than 0.5 TPY, emissions were <u>not</u> rounded off to zero. In such cases a "1" was entered in the appropriate column.

If no regulation was applicable to a pollutant emitted by a source, nines were entered in the appropriate columns on card 5. See the SO_2 emissions in Figure 2.3. Table 2.1 lists the Kansas regulations applicable to specific processes and pollutants. Blanks indicate that there was no regulation applicable to the particular pollutant for that process. Virtually all pollutants other than particulate matter were unregulated. Regulations for SO_2, CO, HC, and NO_x only applied to certain sources built after January 1, 1972. Therefore nines have been entered into the fields on the preprinted NEDS forms. If a

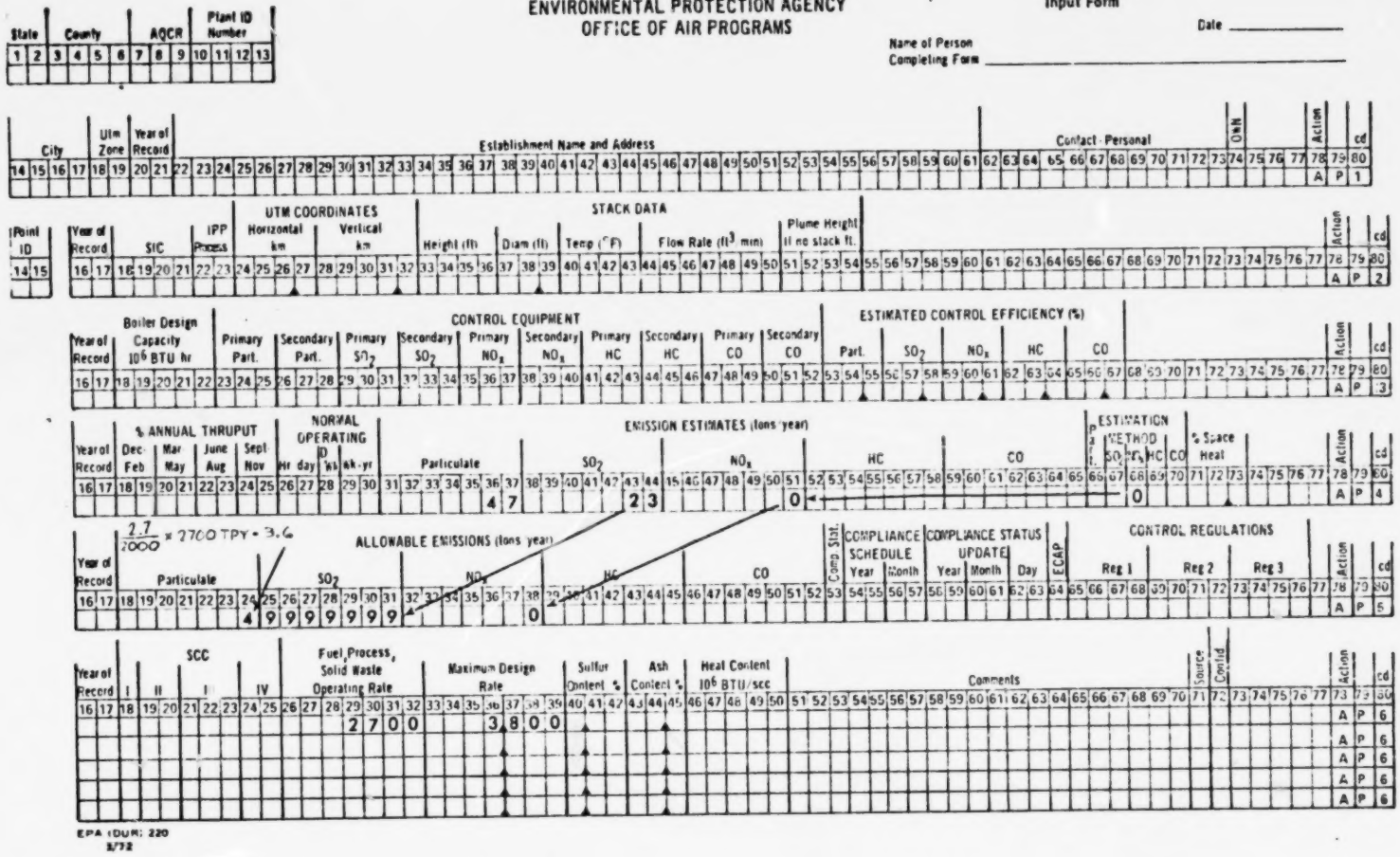

Figure 2.3. Allowable Emissions for Zero Emitters and Unlimited Allowable Emissions.

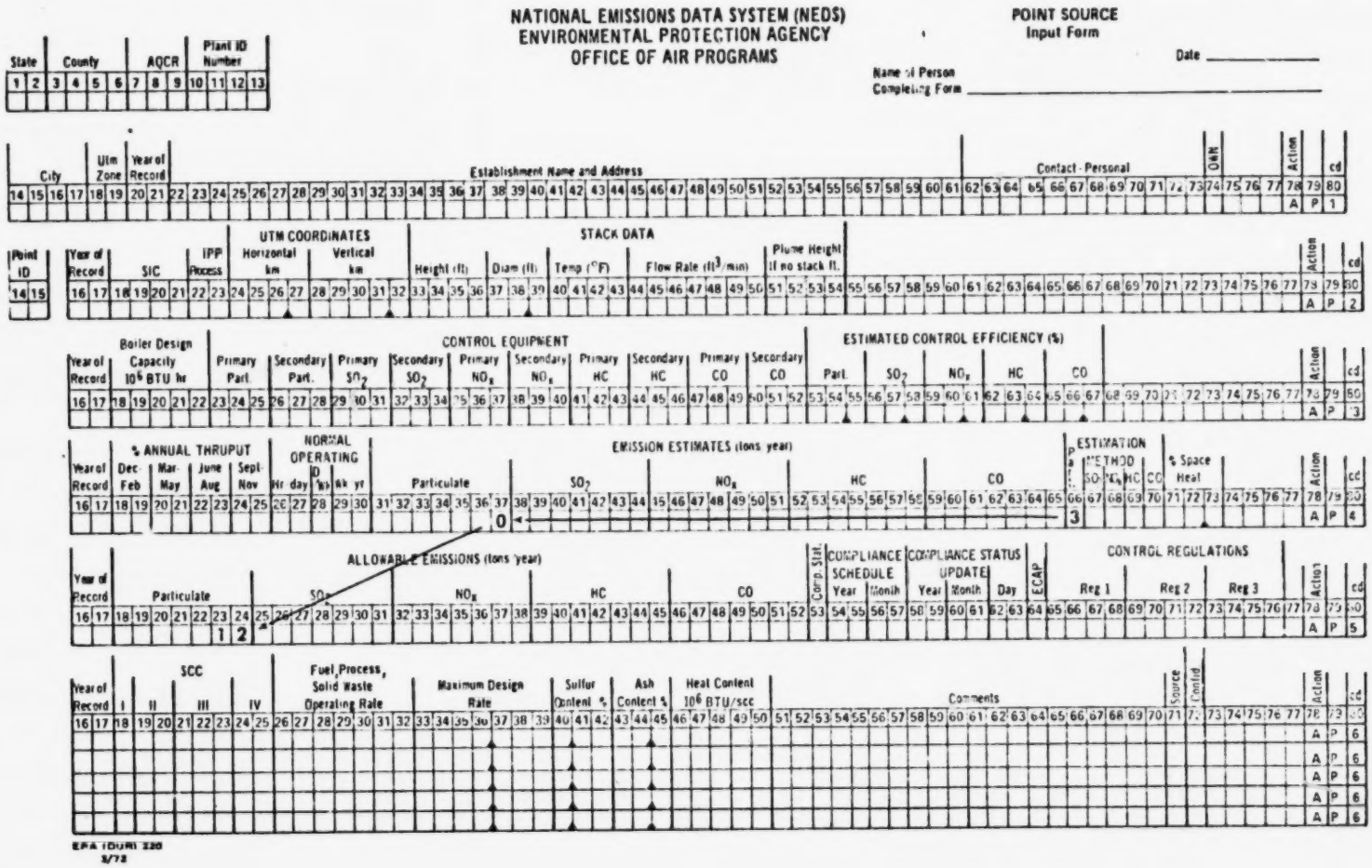

Figure 2.4. Allowable Emissions for Small or Well-Controlled Sources.

Table 2.1. KANSAS AIR POLLUTION EMISSION REGULATIONS

Process	Pollutant Regulated				
	Part.	SO_2	NO_x	HC	CO
All processes	28-19-20				
H_2SO_4 mfg	28-19-20	28-19-22*			
Storage of HC				28-19-23*	
Ethylene plant				28-19-23*	
Cupola	28-19-20				28-19-24*
Cat cracker/petro	28-19-20			28-19-23C*	28-19-24*
Nitric acid mfg	28-19-20				
Boilers & indirect heaters	28-19-31A	28-19-31C*†	28-19-31D*† 28-19-31E*†		
Incinerators	28-19-41				
Non-ferrous smelters	28-19-20	28-19-22*			
Flares		28-19-22*			
Space heaters	28-19-31A				

* Sources existing on 1-1-72 are exempt.
† Sources $\geq$ 250 mm btuh.

source was new (constructed or enlarged after January 1, 1972) and a regulation otherwise was applicable, the preprinted nines were eradicated and the calculated allowable emissions entered.

Using the allowable emission rates obtained from Figure 2.5 the allowable process particulate emissions were calculated as shown in Figure 2.6. In all cases, allowable emissions were based on the hourly maximum design rate (card 6, columns 33-39).

Using the allowable emission rates obtained from Figure 2.7 the allowable indirect heat exchanger particulate emissions were calculated as shown in Figure 2.10. In all cases, allowable emissions were based on the boiler design capacity (card 3, columns 18-22).

Allowable incinerator particulate emissions were calculated using the figures shown on Figure 2.9. These emission rates were derived from the regulation, using theoretical air (adjusted to 12% CO_2). These figures were obtained from the ADL Report (EPA Contract No. CPA 22-69-23) p. V-6 and 7.

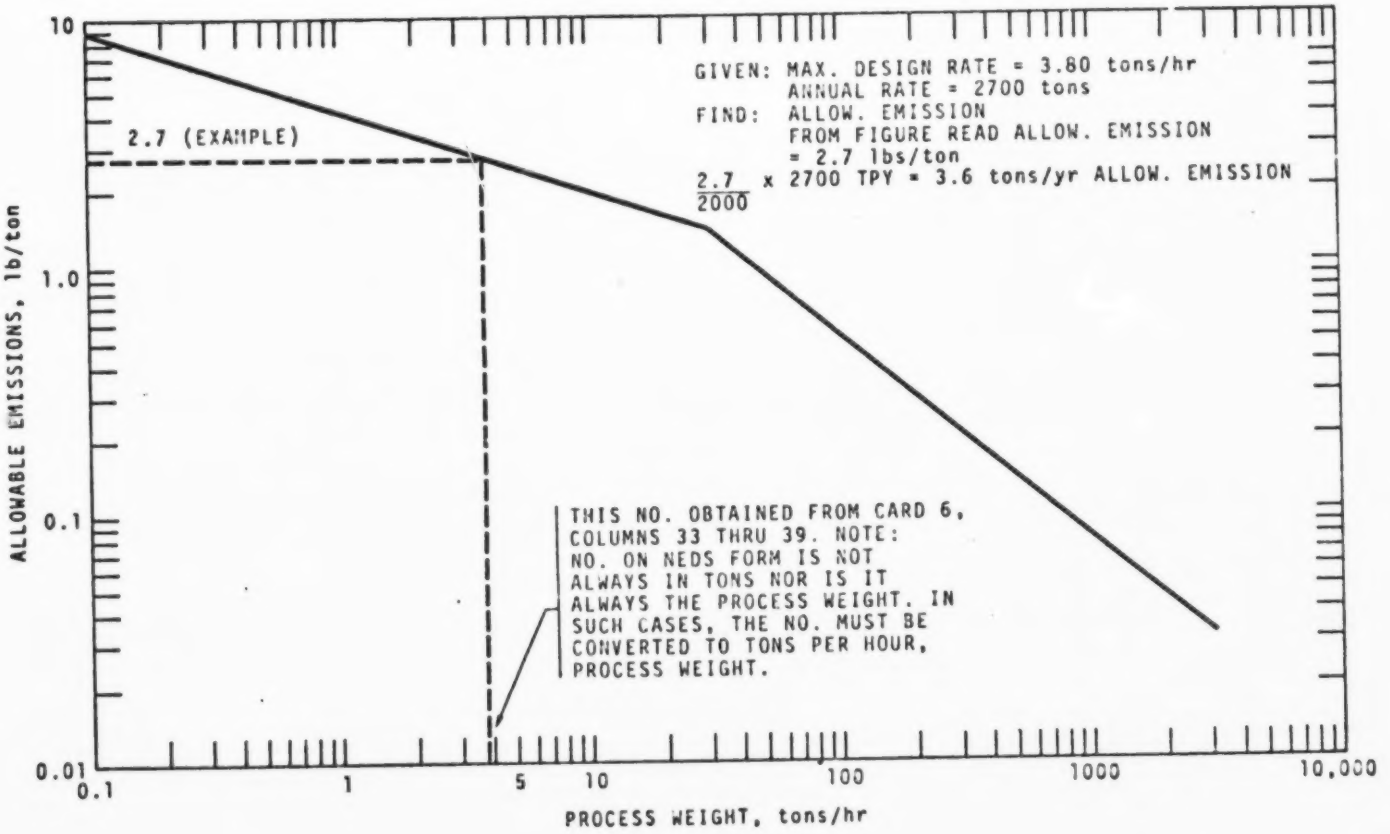
GIVEN: MAX. DESIGN RATE = 3.80 tons/hr
ANNUAL RATE = 2700 tons
FIND: ALLOW. EMISSION
FROM FIGURE READ ALLOW. EMISSION
= 2.7 lbs/ton
2.7/2000 x 2700 TPY = 3.6 tons/yr ALLOW. EMISSION
2.7 (EXAMPLE)
THIS NO. OBTAINED FROM CARD 6, COLUMNS 33 THRU 39. NOTE: NO. ON NEDS FORM IS NOT ALWAYS IN TONS NOR IS IT ALWAYS THE PROCESS WEIGHT. IN SUCH CASES, THE NO. MUST BE CONVERTED TO TONS PER HOUR, PROCESS WEIGHT.
ALLOWABLE EMISSIONS, lb/ton
10
1.0
0.1
0.01
0.1
1
5
10
100
1000
10,000
PROCESS WEIGHT, tons/hr

Figure 2.5. Kansas Regulation 28-19-20 for Process Emissions.

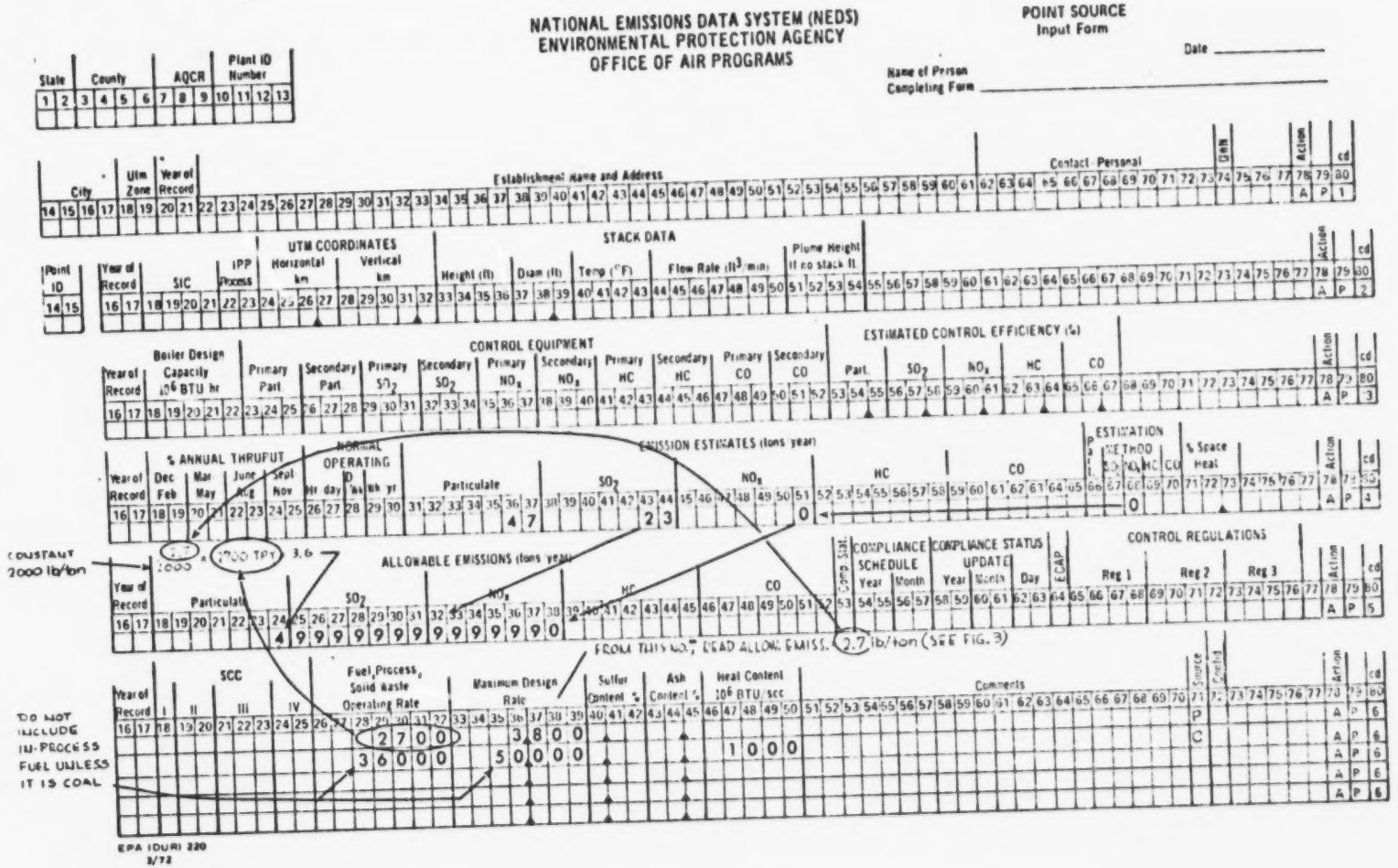

Figure 2.6. Calculation of Allowable Emissions for Processes.

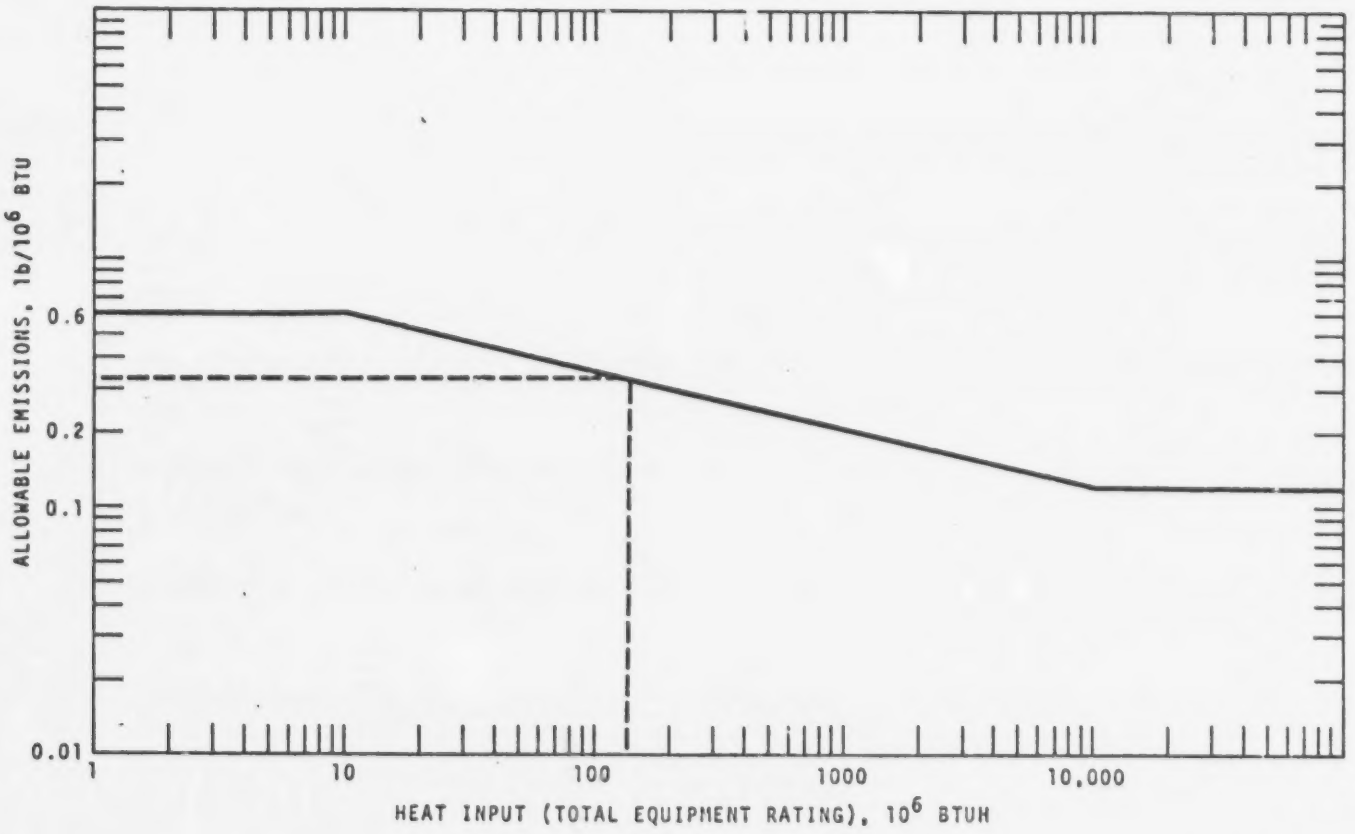

Figure 2.7. Kansas Regulation 28-19-31 for Indirect Heating Equipment.

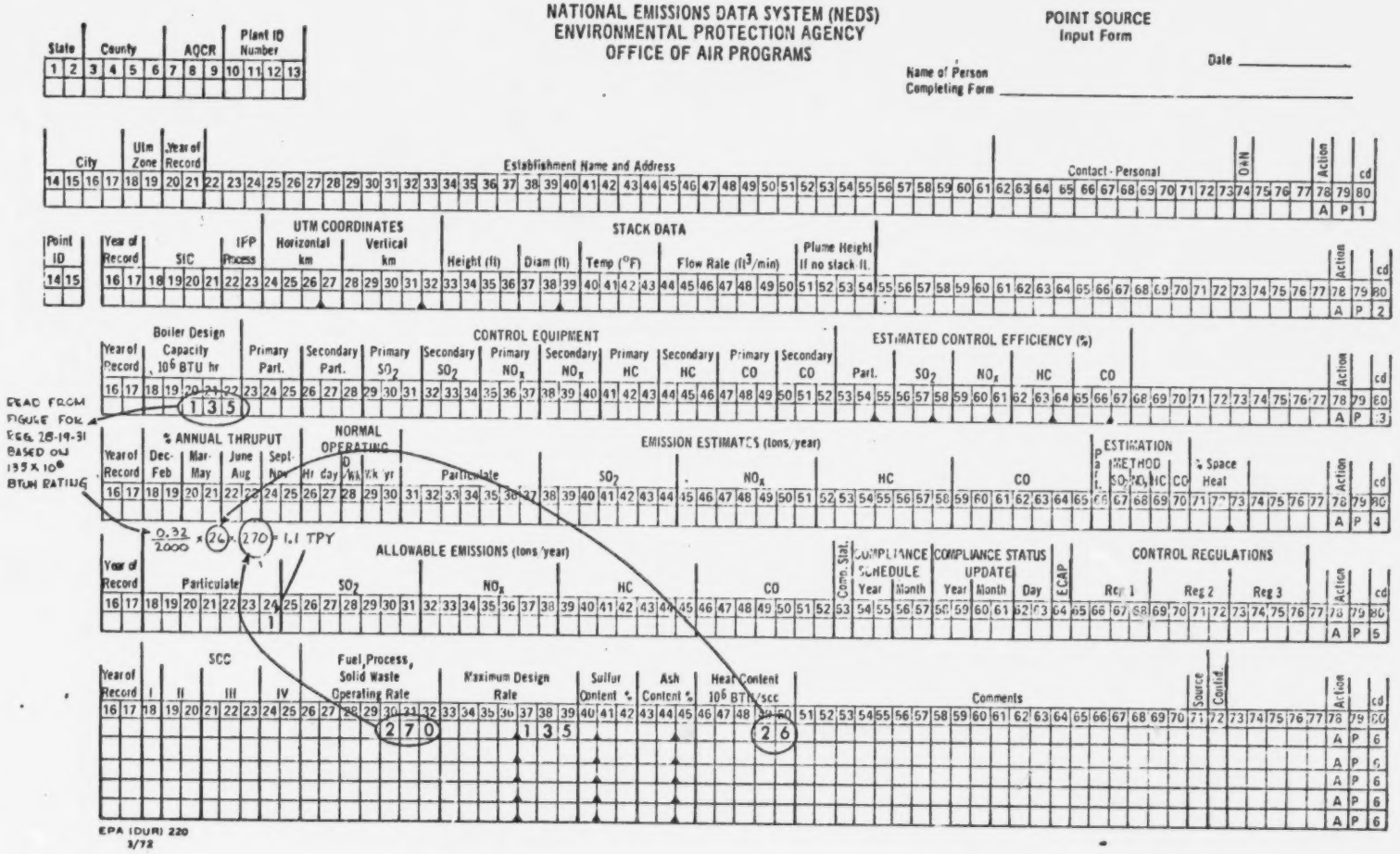

Figure 2.8. Calculation of Allowable Emissions for Boilers.

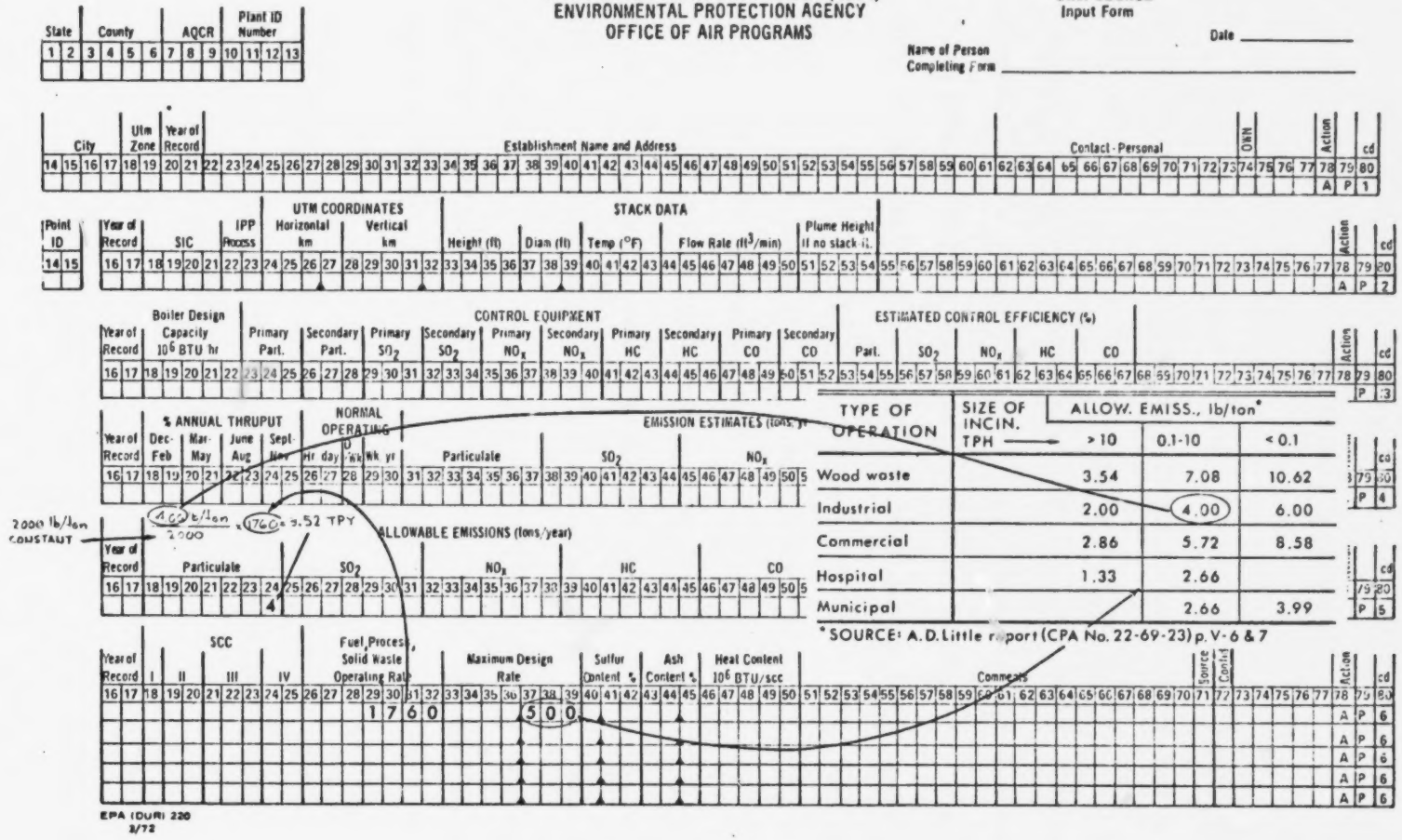

Figure 2.9. Calculation of Allowable Emissions for Incinerators.

2.3 SPECIFIC PROCESSES

The following is an explanation of variations when filling out NEDS forms for some specific sources.

2.3.1 Grain Elevators

The operations of a grain elevator included receiving, transferring and conveying, drying, screening and cleaning, feed manufacturing (hammermill), and shipping. Of these operations receiving, shipping, and transferring and conveying were common to all elevators. Drying, screening and cleaning, and feed manufacturing were only at some elevators. Individual NEDS forms were filled out for the above operations. Since receiving and shipping operations had the same SCC number, notation was made in the comment section as to which operation the NEDS form represented.

While there was no clear-cut definition to distinguish between country elevators and terminal elevators, there were a few basic differences. Country elevators were the smaller, rural elevators and usually received grain by truck directly from the farm. Terminal elevators were few in number, near urban areas and received several million bushels of grain per year, mostly by rail.

The following information about percent annual thruput was compiled by Donald D. Snethen, Air Quality Engineer, Kansas State Department of Health.

> "There are two harvesting periods in the state. They are for wheat and corn, milo, and soybeans. Wheat harvest occurs during the late spring or early summer and corn, milo,

and soybean harvest occurs during the fall.

Since growing and maturity of the grains are greatly affected by various climatic conditions, it is not possible to make more than an approximate prediction as to when the harvest will occur. However, wheat harvest will generally take place between mid-June and mid-July. The harvest progresses from the south to the north. It will begin in the southeast and end in the northwest. After harvesting operations begin at a particular area they will continue for about two weeks. The heaviest activity will last for about one week during this two week period.

The fall harvesting season will begin around mid-September and under normal weather conditions will last for 20-30 days. The general level of activity during the fall harvest is greater than that during the remainder of the year but usually does not reach the same level as that associated with the wheat harvest.

Generally, rail shipping will increase somewhat during wheat harvest but will probably not increase much during the fall harvest. Grain drying is not as great during the wheat harvest as during the fall harvest.

An approximate distribution of the activities at a country elevator is shown in Table 2.2. It should be noted that the activities at terminal elevators and feed manufacturing plants can probably be equally distributed throughout the year.

It should be noted that this information is to provide a rough guideline for the harvesting seasons and should be tempered with the fact that local climatic conditions will govern the start and duration of harvest seasons."

The Source Emission Report gave the annual amount of grain received, handled, dried, cleaned, milled and shipped. The reported amounts received and shipped did not always agree, however. This was due to increases or decreases in the amount of grain held in storage from the previous year.

Table 2.2. APPROXIMATE DISTRIBUTION OF ACTIVITIES AT COUNTRY ELEVATORS

Quarter	Truck Receiving		Grain Drying	Feed Processing
	Wheat	Milo, Corn, Soybeans**		
Dec-Feb	15*	15	20	25
Mar-May	20	10	10	25
June-July	50	5	10	25
Sept-Nov	15	70	60	25

Quarter	Rail Shipping	Screen/Clean	Transfer/Convey
Dec-Feb	20	10	20
Mar-May	30	10	20
June-July	30	70	30
Sept-Nov.	20	10	30

* Percent annual thruput.

** Soybean production carried out in eastern half of state only.

The emission factors used in calculating the emission estimates were based on the use of control devices as follows:

Source	Assumed Normal Control Device Used	Assumed Efficiency	AP-42 Emission Factor, lb/ton
TERMINAL ELEVATORS			
Shipping	Fabric	99.95	1
Receiving	Fabric	99.95	1
Transfer & convey	Cyclone	33	2
Screen & clean	Cyclone	40	5
Drying	Screen house	14	6
COUNTRY ELEVATORS			
Shipping	Cyclone	99.75	5
Receiving	Cyclone	99.75	5
Transfer & convey	None	0	3
Screen & clean	None	0	8
Drying	None	0	7

If a source had a control system which was better than the assumed control device, the increased efficiency in calculating the emissions was considered. For purposes of these calculations, the efficiencies and uncontrolled emission rates shown in Table 2.3 were used.

The AP-42 emission factor for barley feed manufacturing was 3 lb/ton at the cyclone exit. It was assumed that the feed was manufactured by hammermills. For feed manufacturing of any grain other than barley, the emission factor was assumed to be 3 lb/ton.

The Kansas Department of Health did not formally evaluate grain elevators for compliance with state regulations. This was because the state considered currently available published information used to evaluate processes not to be fully comprehensive

Table 2.3 EFFICIENCIES OF VARIOUS CONTROL SYSTEMS

Type of Control System	Emission Source			
	Ship & Receive	Transfer & Convey	Screen & Clean	Drying
Fabric	99.95	99.0	99.0	99.0
Cyclone	99.75	33	40	-
Fabric & cyclone	99.99	99.7	99.6	-
Gravity Collector*	-	-	20	-
Uncontrolled emissions, lb/ton	2000	3	8	7

* A dust bin gravity collector is occasionally used as a control device on screening and cleaning. The State of Kansas Agency calculates the efficiency of the dust bin to be 58.6%. It is unlikely, however, that a gravity collector would be more efficient than a cyclone (which is 40% efficient on screening and cleaning, based on information taken from AP-42). Therefore for this project, the control efficiency for a dust bin gravity collector is assumed to be 40%.

in considering all factors present in the grain handling industry. Official judgment was based upon visual observations during plant inspections under a variety of climatic and operational conditions. In the interim until official judgment is made, the grain elevators were considered in compliance.

The maximum hourly production rates, necessary for the calculation of allowable emissions, were usually reported for grain drying and feed manufacturing (hammermill). Therefore, allowable emissions for these operations were often calculated. Since the maximum hourly rate was not given for receiving, transferring, and conveying or shipping, allowable emissions for these operations could not be calculated. The maximum hourly rate for screening and cleaning was seldom given, hence the allowable emissions for this process were rarely calculated.

2.3.2 Flour Mills

When entering a flour mill into NEDS, one form was entered for each of the following three operations: receiving, transferring and conveying, and screening and cleaning the grain. An additional two forms were filled out, one being for additional grain cleaning and the other for the flour milling process.

The flour mill grain cleaning form for additional cleaning was assumed to include the aspirators, disc separators, scourers, and stoners. EPA approved emission factors from AP-42 for these processes combined were 0.2 lb/ton for barley or wheat and 0.4 lb/ton for milo. Both emission factors were at the cyclone exit. The annual thruput entered on this NEDS

form was equal to the amount of grain received. The hourly maximum rate was equal to the lowest maximum rated capacity of the four operations.

The flour mill grain milling form included the operations of entoleters, roller mills, sifters, purifiers, pneumatic and mechanical conveying, feed hammermills, and shipping. The AP-42 emission factor for barley flour milling was 3 lb/ton at the cyclone exit. The emission factor for wheat or milo flour milling was estimated to be also 3 lb/ton at the cyclone exit. The assumption was made that if a baghouse control was used it would be 99.99% efficient for an emission factor of 0.2 lb/ton at the filter exit. Also, if a cyclone was used in series before the baghouse, the emission factor would be 0.1 lb/ton (99.995% efficient) at the filter exit. The annual thruput for the milling was also equal to the amount of grain received and the maximum hourly rate was equal to the maximum rated capacity of the roller mills.

2.3.3 Alfalfa Dehydrators

In alfalfa dehydrating plants, receiving, drying, hammermilling, pelletizing, pellet cooling, pellet regrinding and shipping were all combined on one NEDS sheet. The emission factor of 60 lb/ton of dry hay was for the total plant emissions and was from the primary cyclone exit. The primary cyclone was not entered on the NEDS form as a control device. This was because the primary cyclone was considered an integral part of the dehydrating operation and the emission factor was at the primary cyclone exit. Controls after the primary cyclone such as fabric filters were entered on the NEDS form.

Total particulate allowable emissions entered on card 5 equaled the sum of the allowable emissions calculated for the dryer, hammermill, pelletizer, and pellet regrinder. Allowable emissions for the dryer were calculated on a wet hay basis, that is, hay into the dryer. The wet hay input to the dryer was calculated using the ratio of the water evaporation rate to dry hay operating rate plus the annual amount of dehydrated hay produced. Example:

4 tons/hr hay dried + 10 tons/hr water evaporated = 14 tons/hr dryer capacity

Annual production = 9,000 tons/yr dehydrated hay

$$9{,}000 \text{ tons/yr} \times \frac{10 \text{ tons/hr water evaporated}}{4 \text{ tons/hr hay dried}} = 22{,}500 \text{ tons/yr water evaporated}$$

9,000 tons/yr hay + 22,500 tons/yr water = 31,500 tons/yr input to dryer

If the ratio of water evaporated to dry hay operating rate was not known, the assumed ratio of 2.5 tons of water evaporated per ton of dry hay was used in the calculations.

Hammermill and pelletizer operations occured after the water had evaporated, hence for the purpose of allowable emission calculations the annual operating rate for each of these processes was equal to the annual production reported by the source. The maximum hourly production rates for these processes were also reported by the source. The maximum hourly rate entered on card 6 of the NEDS form was equal to that of the hammermill.

2.3.4 Reciprocating Internal Combustion Engines

Electric generators in some small communities were powered by reciprocating internal combustion engines. These engines

were fueled by a combination of natural gas and oil. Natural gas was the primary fuel and was used in conjunction with a small amount of fuel oil. The emission factor used for the combustion of natural gas was 770 lb NO_2 per MM CF. This factor was taken from the emission factor book under natural gas combustion, gas engines. The emission factors for the oil combustion were assumed to be equal to those for heavy duty truck diesel engines. The total emission estimates entered on card 4 of the NEDS form were the sums of the natural gas and oil emissions.

Allowable emission regulations that applied to these engines were visual opacity regulations only. This permitted unlimited amounts of SO_2, NO_x, HC, and CO to be emitted with particulate emission compliance based on visual observation. Therefore, particulate allowable emissions on card 5, columns 18 through 24, were left blank and 9's were entered in columns 25 through 52 to denote no limitation of SO_2, NO_x, HC, and CO pollutants.

2.3.5 Foundry Operations

The following procedure was used in calculating the estimated emissions from foundry sand handling and grinding and also from mold ovens.

2.3.5.1 Foundry Sand Handling and Grinding - Emissions could only be calculated when the exit gas volume (scf) of the stack was determined. The emission factor used here was 40.75 gr/scf. This number was taken from "Air Pollution Aspects of the Iron and Steel Industry", PHS Publication No. 999-AP-1 (1963). This

number represents total emissions from sand handling and grinding operations.

When this emission factor was used, a "4" was placed in column 66 of card 4.

2.3.5.2 Foundry Mold Ovens - Emissions could only be calculated when the exit gas volume (scf) of the stack was determined. The emission factor for hydrocarbon emissions was 6.0 lb/mm scf. This number was calculated using data from Air Pollution Engineering Manual, U. S. Dept. of Health, Education, and Welfare, Public Health Service, page 314.

In summary, the following emission factors were used:

Operation	Uncontrolled Emissions, lb/mm scf		Cd. 4 Entry	
	Part	HC (expressed as methane)	Col. 66	Col. 69
Sand handling and grinding	6000	0	4	0
Mold Ovens	24	6.0	4	4

2.3.6 Stone Quarry

Stone quarry operations included primary crushing, secondary crushing, tertiary crushing, recrushing and screening, fines mill, miscellaneous operations of screening, conveying and handling, and also open storage. The emission factors for primary, secondary, and tertiary crushing, and the fines mill were all based on raw material entering the primary crusher. Since the source emission reports provided approximate annual production, it was assumed that all material processed entered the primary crusher and therefore annual production equaled raw

material processed. The emission factors for the miscellaneous operations of screening, conveying, and handling, and for storage pile losses were based on tons of stored product. The assumption was made that all the product was at one point stored. Therefore, the annual production was entered as tons of stored product. The emission factor for recrushing and screening was based on thruput for that operation.

The address assigned to portable rock crushers was that of the home office, city, and county. Permanent crusher installations were given the address of their permanent location.

The allowable emissions for the stone quarry operations of primary crushing, secondary crushing, tertiary crushing, and the fines mill were based on the hourly maximum rate for the individual operation and the total annual production. The allowable emissions for the recrushing and screening operation were based on the maximum hourly rate and total annual production for that operation only. Allowable emissions for the miscellaneous operations of screening, conveying, and handling, and also storage pile losses were based on visual opacity regulations.

2.3.7 Asphalt Batching

Asphalt batching sources consisted of portable or permanent installations. Portable asphalt batching plants were assigned the address (city and county) of the home office. Permanent installations were listed at the address where the plant was located.

2.3.8 Gray Iron Cupola

Calculation of allowable CO emissions from new cupolas in gray iron foundries was calculated as follows. Kansas Regulation 28-19-24 was a design standard rather than an absolute emission limitation. While the standards seemed stringent enough to provide complete oxidation of the CO, Publication AP-42 stated that where an afterburner was used, CO emissions were 9 lb/ton.

Therefore, cupola CO emissions were calculated as follows:

	CO emissions; lb/ton		
	Uncontrolled	Controlled	Allowable
Cupolas built prior to January 1, 1972	145	9	9999999
Cupolas built after to January 1, 1972	145	9	9